



## Near Earth Network, Advanced Communications for Mission Success



The Near Earth Network Project, organized within the Exploration and Space Communications Projects Division, is located at the Goddard Space Flight Center, with members at both the Greenbelt campus and the Wallops Flight Facility campus. The Near Earth Network Project manages, operates, and maintains NASA's Near Earth Network (NEN).

The NEN is comprised of NASA-owned and commercial tracking stations located throughout the world.

NASA-owned assets under the NEN are located at the following stations:

- Wallops Ground Station (WGS) in Virginia, operated by NASA
- McMurdo Ground Station (MGS) in Antarctica, operated by NASA
- Alaska Satellite Facility (ASF) in Alaska, operated by the University of Alaska, Fairbanks (UAF)
- White Sands Complex (WSC) ground stations in New Mexico, operated by NASA

The NEN provides a significant portion of its space communications services by contracting with commercial service providers to support NASA missions. The commercial services provided by these contractors are available to NASA's NEN customers through existing contracts. Commercial service providers currently available include:

- Kongsberg Satellite Services (KSAT) station in Svalbard, Norway, Antarctica, and Singapore
- Universal Space Network (USN) stations in Alaska, Hawaii, and Australia
- Swedish Space Corporation (SSC) station in Santiago, Chile

- SSC station in Weilheim, Germany and Kiruna, Sweden
- South African National Space Agency (SANSA) station in Hartebeesthoek, South Africa

The NEN provides Telemetry, Tracking, and Commanding (TT&C) services to an extensive and diverse customer base of approximately 35 missions - from the high-rate Earth Observing System (EOS) missions such as Aqua, Aura, and QUIKSCAT; to Small Explorer (SMEX) missions including SWIFT, AIM, IRIS, and NuSTAR. The network also provides TT&C services for orbiting satellites through periodic contacts or "passes" that average 140 passes per day for the network. The stations located in polar regions, such as KSAT's Svalbard Ground Station (SGS) in Norway, the NASA and USN ground stations in Alaska, and the McMurdo Ground Station in Antarctica receive more than half of those passes each day collectively.

Services provided by the NEN primarily support flight missions through short duration contacts as spacecraft orbits take them over NEN ground stations. These missions require daily and sometimes hourly periodic contacts in their orbital and suborbital locations, including Low Earth Orbit (LEO), Geosynchronous Earth Orbit (GEO), lunar, and highly elliptical orbits. Each of the daily TT&C supports is scheduled through the NEN Scheduling Office (NENSO), located at NASA's White Sands Complex, in White Sands, New Mexico. Since the inception of NASA's flight missions in 1958, the agency has depended upon the quality and reliability of ground based TT&C services offered by the NEN. The NEN emerged from a

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series of communications networks with a rich history of enabling space flight mission success. Network resources are continuously evolving to meet the changing communication needs of the many missions it supports.

NASA implemented its first ground-based communications network, the Manned Space Flight Network (MSFN), in the 1960s. The MSFN was a worldwide communications network with stations primarily located at low-latitudes to support the Mercury, Gemini, and Apollo programs. During this same decade, NASA also acquired responsibility for the Department of Defense's Minitrack system, evolving into the Satellite Tracking and Data Acquisition Network (STADAN) to support an emerging class of satellites requiring enhanced communications.

During the 1970s, NASA merged the MSFN and STADAN, forming the Spaceflight Tracking and Data Network (STDN) to support the communications needs of manned and unmanned spacecraft missions. During the next few decades, NASA decommissioned and commissioned STDN stations in response to the agency's communications needs. NASA expanded the STDN in the 1980s to provide crucial support to the space shuttle while the agency developed the Space Network (SN). As the SN became operational, it enabled a reduction in the number of STDN stations required to support NASA missions.

In the 1990s, NASA required ground-based stations to provide communications support for a series of high-data-rate science missions in low-Earth orbit primarily due to the agency's Mission to Planet Earth (MTPE) initiative. The communications needs of



these spacecraft required the addition of several ground stations in Earth's polar regions. Also, mission support requirements changed enabling the closure of certain equatorial sites. As a result, NASA transformed the STDN into a set of stations initially called the Ground Network (GN), and more recently renamed as the NEN. In addition, NASA began utilizing an emerging set of commercial TT&C stations to supply services for flight missions.

Today, the NEN utilizes a diverse set of resources to provide high quality services at the lowest cost to support flight missions. Current NEN resources include globally located NASA-owned orbital tracking systems, commercial orbital tracking stations, NASA partner stations, a scheduling system, and test systems. A key enabler to providing low cost services is the NEN project's unique business practice. It carefully blends the use of a large commercial and international provider base with NASA-owned assets to fulfill the changing needs of NEN-supported mission communication requirements.

NEN customers include NASA's Science, Space Operations and Exploration Systems Mission Directorates, as well as other government agencies, international civilian space agencies, and commercial entities. Primary NEN Project activities involve the achievement of the project's operational requirements, mission safety, maintenance, sustainment, and improvement of NEN systems. The project also periodically conducts upgrade and/or

development efforts to ensure NASA is able to meet all commitments to missions identified in the Space Communications Mission Model (SCMM). NEN advancements and upgrade activities involve development or procurement of new systems designed to meet future customer requirements, or replacement of aging or obsolete equipment with state-of-the-art systems to ensure network proficiency and availability.

The NEN is currently augmenting its ground station network by adding permanent launch communication stations to provide launch head and wing site communication services for missions launched from Kennedy Space Center (KSC). These stations will provide high rate TT&C services between the launch vehicle at KSC and the Mission Control Center (MCC). The primary users of these new ground stations will be NASA's Space Launch System, or SLS, a space shuttle-derived heavy launch vehicle, and the Orion Multi-Purpose Crew Vehicle (MPCV).

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*For more detailed information on the Near Earth Network, see*  
*<http://esc.gsfc.nasa.gov/space-communications/NEN.html>*

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